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Now, while we think of all evolution as the result of some kind or other of Selection this remains an enigma. But when we distinguish between the two processes of Isolation and Selection and assign to each its true function we get at once the explanation of our difficulty. Determinate Evolution is due to the combined action of Isolation and Selection. Indeterminate Evolution is due to the action of Isolation alone.

I think that Darwin had this distinction in his mind when he said that Natural Selection was the chief, but not the only, cause of the origin of species. At any rate, it seems to me to embody the whole truth, although Darwin's attention was chiefly devoted to establishing the cause of Determinate Evolution by, what I hope we may still call, Natural Selection.

F. W. HUTTON.

CHRISTCHURCH, NEW ZEALAND, March 1, 1898.

#### MODERN STRATIGRAPHICAL NOMENCLATURE.

ONE of the most noteworthy features connected with every one of the various branches of the rapidly expanding science of modern geology is a widespread and oft-deplored change in terminology. Old names are discarded, the meanings of others are altered, and a host of apparently useless new ones are proposed.

In no department has the coining of new names gone on more vigorously than in stratigraphical geology. The reason is to be found partly in the naturally favorable conditions that prevail in the field, but largely in the change of base that this branch of science has undergone in late years.

The fundamental conception of the geological formation, whether large or small, whether a great series or a single bed, is a sharply defined 'geological unit' instead of a vaguely bounded 'group' of layers. The former is now clearly distinguished by strictly physical characters that are inherently the direct outgrowth of the actual conditions giving rise to the formations. The latter have been too often based upon trivial or accidental features that are relatively unimportant as critical criteria, either in correlation or classification.

The principle underlying the recent change

in the method of naming geological formations gives to each stratigraphical unit a special geographical designation taken from some prominent town, watercourse, or feature of relief, within the boundaries of the formation and where the latter is typically or unusually well shown. As thus established, the formation is a well-defined and independent unit, having a definite position in space, and always an exact relative place in the geological scale, no matter how the latter may be changed afterwards or what method of classification is followed. This definite stratigraphical unit contrasts strangely with the unwieldy, ill-defined and usually little understood large 'group' of the past, the very name of which commonly indicated either a lack of exact knowledge of itself, or a covering-up of almost total ignorance regarding its real affinities.

To be sure, the nomenclature in the field of geology has been greatly increased, even enormously enlarged, by the introduction of the plan. The former list of names numbered only two or three score or so—names of the smallest subdivisions that went to make up the general geological column. The names of the new list run up into the hundreds or even thousands, are different in every region, and additions are constantly being received.

Against this copious multiplication of geological names protests long and loud have gone up these several years past. Still, from time to time, the protestations continue to be uttered. Curiously enough, the struggle, if such it might be called, has been largely reduced to a clash between the practical field geologists on the one hand and on the other the laboratory workers, those especially interested in some particular and limited phase of geology, and the paleontologists who see, in the new scheme, their standard classification scattered to the four corners of the earth and their usefulness in the domains of geology diminished. And the former have manifestly won.

When, a decade and a-half ago, various geological surveys in this country were established or reorganized those intrusted with the work soon found that if speedy and exact results were to be secured—substantial data upon which all other workers could easily build—

something else must be devised than the existing cumbersome and unsatisfactory scheme of vaguely defined geological formations, having no comparable limits in the different geological provinces and even diverse values in the same province, some plan that must be natural and at the same time elastic. Practical experience in the field and the demands of the times soon pointed out a feasible scheme. So well has it served the purpose, and so readily adaptable is it to the changing conditions met with on all sides and to all the unforeseen exigencies continually arising, that it has brought under its standard nearly every practical field geologist.

The present method of designating geological formations by geographical names certainly does greatly expand the nomenclature at times seemingly to a burdensome extent. This appears to be the only objection that has been urged against the plan that might call for notice. Yet, to all except those who do not wish to go beyond the ordinary text-book in geological work, even this seems hardly worthy of special argument, since it is offset by so many manifest advantages.

It may be truly said that no greater boon to the working, as well as to the theoretical, geologist has been devised. Incorporated in the new plan are practically all of the salient good features of the old method, while none of the many objectionable ones are retained. Since its adoption a vast mass of exact information has been obtained that was previously unthought of--information that is in shape to be always used, without the necessity of going all over the ground again; the other departments of geology have been greatly aided, and stratigraphical geology itself has been capable of making greater real progress in the one short decade that has elapsed since the method came into use than in all time previous. In the same short period more has been learned about the real nature of sedimentation, the actual relations existing between different rock formations and the structure of the layered cuticle of the globe, than was possible before. In fact, a rational basis for geological correlation and a genetic classification of formations has been found.

The real meaning, then, of the multitude of new titles that has recently made its appear-

ance in the literature of stratigraphy is the practical adoption of more refined methods of geological work, the provision of means for the collection of more exact geological data and the grasping of more rational conceptions regarding geological correlation and classification.

CHARLES R. KEYES.

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#### SCIENTIFIC LITERATURE.

*Die Farnkräuter der Erde.* By H. CHRIST. Jena, Gustav Fischer. 1897. Mit 291 Abbildungen. 8vo. Pp. 388. 12 M.

In the preparation of such a work as the above one is expected either to have in mind the filling of a felt want, or at least to furnish a sufficient reason for the expenditure of so much energy. Neither of these seems to have been considered in the present case, if we judge of the work by the test of completeness which the title would lead us to expect. The purpose of the work seems to be the presentation of the general systematic relations of the genera and characteristic species of ferns, without attempting completeness either in the flora of a given region or the full quota of species of any particular group. As a manual for the identification of species its value can only be slight, as it is most likely to be deficient at the point where it is most needed, for usually there is no suggestion whatever of the nature, distribution or number of the allied species, and the specific descriptions that are given are not uniformly full, many of them being very incomplete. The work will be useful within narrow limits, however, particularly among florists and those to whom scientific accuracy is not so uniformly important. It describes more or less completely 1154 species of ferns, which, at a moderate estimate, cannot much exceed one-third of the known species of the world.

The system of classification is not strikingly novel, following in the main that of Mettenius and Prantl. While the number of recognized genera (99) is considerably larger than that recognized at Kew, which has been followed in this country, it will by no means satisfy those who regard genera, among ferns as elsewhere, as natural groups of organisms closely connected in habit and other biological characters, instead of artificial groups thrown together for conven-